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Observation of Short-Term Changes in Jupiter's Radiation-Belt Emission with the VLA

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Abstract

We present the first evidence of short-term variations of Jupiter's radiation-belt emission obtained with interferometric measurements. Over a two-month period of observational time in 2002, we have observed the Jovian synchrotron emission with the Very Large Array (VLA). The images constructed at the wavelength of 6 cm demonstrate significant changes in the spatial structure of the brightness distribution. We report that the peak brightness distribution near the magnetic equator evolved differently during the 10-hour rotation of the planet and over the campaign of observations.

Our detailed analysis of the equatorial brightness will show that, for a series of CMLs, the radiation peak near 1.4 Rj was shifting back and forth from one side of the planet to the other on a time-scale of days [1]. We will demonstrate that the change in the location of the emission peak is the result of fluctuations in the peak brightness distribution by 10% up to 40%. We will show how the source of variability can be linked to the angular sectors covering the Jupiter SIII longitudes where the field strength along the equatorial magnetic surface is maximum or minimum [1]. We will discuss the possible mechanism taking place in the innermost region of Jupiter's magnetosphere and responsible for the variability of Jupiter synchrotron emission on short time-scales.

Finally, we will present the first results of a new VLA campaign. New observations have been scheduled from mid-June to mid-September 2009 to provide additional images to analyze and compare with our maps constructed from the VLA 2002 Fall data sets [2]. From new data sets, we will be able to further examine the regions where the fluctuations are generated and investigate the process responsible for short-term changes in Jupiter's radiation-belt emission.

References

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